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# AN AFM INVESTIGATION OF GROWTH HILLOCK MORPHOLOGY AND SURFACE SMOOTHENING ON $KH_2PO_4$ {101}

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We have investigated the morphology of the {101} face of tetragonal KDP crystals as a function of supersaturation, s, using both *in situ* and *ex situ* atomic force microscopy. Growth typically occurs by step-flow on anisotropic tri-pyramidal hillocks formed by dislocation-induced, 5Å, monomolecular steps. All dislocations exhibit hollow cores whose circular cross sections are consistent with an isotropic step edge energy and whose radii are in good agreement with theoretical predictions. We have found that the slope of the growth hillocks is weakly dependent on supersaturation, s, for s >0.05. Previous analyses of this dependence have ignored the fact the spiral must turn around the hollow core of the dislocation. We derive analytic approximations and perform numerical calculations which take into account the presence of the cores. The results show that, even for single dislocation sources, the dependence of slope on supersaturation is nonlinear. At low s the slope is controlled by the critical radius and is linear in s, while at high s the slope reaches a limiting value determined by the size of the hollow core. The value of s at which this crossover occurs is determined by the size of the Burgers vector of the dislocation source. We have also observed the diffusion of monomer and the process of Ostwald ripening of islands and steps in air. Island coalescence and dissolution, step smoothening and spiral equilibration are all observed over a period of many days. The decrease in island radius exhibits a cubed dependence on time showing that dissolution is mass transport limited and that this transport is by surface diffusion. This work was performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under contract No. W-7405-ENG-48.